WASHINGTON STATE

Washington State Patrol Retirement System

Experience Study

1989 - 1994

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I. Introduction

This is a report of the findings of our study of the Washington State Patrol Retirement System for the six-year period ending December 31, 1994. The purposes of this Experience Study are to:

- Review actual experience under a retirement system in relation to the actuarial assumptions in current use;
- Review the actuarial method and other aspects of the actuarial basis;
- Develop such changes in the actuarial basis (actuarial method and actuarial assumptions) as may be indicated by such review; and
- Create data and statistics which are required for other applications such as fiscal notes.

There are two distinct types of assumptions used:

(1) Demographic assumptions - estimating flows of people through the system and non-economic factors that affect benefits.

(2) Economic assumptions - estimating the impacts of economic factors on benefits and salaries, and their present values.

II. Summary of Demographic Findings

Mortality

Mortality of retirees continues to improve at all ages.

Retirement

Retirement rates have been lower than expected at all ages.

Disability

Disability benefits are not provided through the pension system. They are tracked for informational purposes because they impact other assumptions.

Termination

Termination rates increased for younger, lower service members. It was unchanged for older, higher service members.

Vested Termination

Members who terminated generally left their contributions in the system more often than they had in the previous study period.

Step/Longevity Salary Increase

Step/longevity salary increases varied only slightly from the prior experience study period.

Cashouts, Extra Contracts, and Boosting the Average Final Compensation

Members experienced above-average salary increases prior to retirement. Additionally, members cashed out annual leave and holiday pay. This has the effect of increasing the Average Final Compensation by 8%.

III. Demographic Assumptions

GENERAL

Demographic assumptions are those which can be readily established by statistical studies of past experience. All data used in this study was provided by the Department of Retirement Systems. The data used was based on the information provided for the annual actuarial valuation of WSPRS for 1989-94.

The valuation detail files for 1989-94 were merged to produce a single record for each person who was a member of the system during any part of the study period. Each record provides a service and salary history over the study period.

We analyzed this file for each of four causes of decrement: mortality, retirement, disability, and turnover. Our analysis revolved around ratios of actual to expected experience, both year-by-year and for the entire study period. Tables showing ratios of actual to expected experience both on the old and suggested new basis will be set out for each decrement as it is discussed.

There are two factors which make this experience study of WSPRS unique. First, the number of active members averaged less than 1,000 through the study period. For many decrements, we expect very little experience and rates cannot be accurately set on small samples. Consequently, sometimes rates were set in concert with the rates for the Law Enforcement Officers and Fire Fighters Retirement System. The experience of law enforcement officers can be expected to be rather similar and the size of LEOFF is significantly larger, making its results quite credible.

Second, during 1990 the WSPRS valuations were changed from a fiscal year to a calendar year basis. This created a discontinuity in the annual experience studies. In many cases we studied the period 1991-94.

MORTALITY

There are three mortality bases to be reviewed: Pre-Retirement Mortality, Post-Retirement Mortality, and Beneficiary Mortality.

During the winter of 1995 the Society of Actuaries published a draft of the 1994 Uninsured Pensioner Mortality Table (UP 94). The final version was not expected to be adopted until after the completion of this experience study. Therefore, it was decided that the preliminary UP 94 should be used. In the event the table adopted varies from the preliminary table, changes will be reflected and noted in the 1995 valuation.

We shall use the convention UP 94(-3,-1) to abbreviate 1994 Uninsured Pensioner Mortality Table with male ages set back three years and female ages set back one year. A setback is used when the mortality of the plan's members is lower than that used in developing the table. For example, if the experience of 70-year-olds in the plan is that of 67-year-olds in the mortality table, a three-year setback is used.

Mortality rates have steadily declined through the years (though not uniformly by age or sex) reflecting advances in medicine, the availability of paramedics, etc. We have not explicitly reflected future mortality improvements in our new assumption.

During the six-year experience study period, mortality improved about 1 year.

Post-Retirement Mortality

The 1994 Uninsured Pensioner table with a one-year set-forward for males and females provides an excellent model.

Pre-Retirement Mortality

Mortality rates of active members prior to retirement age are very small and have limited impact on actuarial results. Also, because many illnesses force termination prior to death, mortality is difficult to determine. For these reasons we will use the same basis for pre-retirement as for post-retirement mortality.

Beneficiary Mortality

This group includes both the beneficiaries of active duty deaths and the beneficiaries of retiree deaths. We will use the same table for beneficiaries as for retirees.

Pre- and Post-Retirement Mortality

Old Basis: The 1983 Group Annuity Mortality Table: Ages are set forward one year.

New Basis: The 1994 Uninsured Pensioner Mortality Table: Ages are set forward one year.

LIFE EXPECTANCY

Age	Old Assumptions	New Assumptions
30	47.1	47.6
40	37.5	38.0
50	28.3	28.7
60	19.8	20.1
70	12.5	13.0
80	7.2	7.6
90	4.0	4.1

TABLE 1

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Mortality Experience
Retiree Mortality
1989 - 1994

		1983 Group Annuity 994 Uninsured Mortality*		1 Pensioner Mortality *	
Age	Actual	Expected	Ratio	Expected	Ratio
-54	0	2	0	1	0
55-59	4	3	1.33	3	1.33
60-64	2	5	0	5	.40
65-69	8	5	0	5	1.60
70-74	7	7	1.00	6	1.14
75-79	12	12	1.00	10	1.20
80-84	5	6	.83	5	1.00
85-89	0	3	.00	3	.00
90+	2	2	1.00	3	.67
Total	40	45	.89	41	.98

* Ages are set forward one year.

TABLE 2

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Probability of Mortality
Actives, Retirees and Beneficiaries

Age	Male Mortality	Female Mortality
20	.053%	.029%
25	.070%	.029%
30	.082%	.037%
35	.086%	.051%
40	.116%	.077%
45	.172%	.103%
50	.287%	.157%
55	.495%	.256%
60	.899%	.509%
65	1.624%	.969%
70	2.595%	1.495%
75	4.086%	2.532%
80	6.862%	4.395%
85	10.579%	7.535%

SERVICE RETIREMENT

The ages at which members retire is a major factor in the cost of a retirement system. The study of service retirement shows lower retirement rates at all ages. Because retirements do not occur uniformly throughout the year, our 1990 transition from fiscal to calendar year valuations created aberrations in the data. Therefore, retirements are studied from the years 1991-94. Because the number of members eligible to retire in 1989-90 was significantly smaller than from 1991 on, this had virtually no impact on the results.

RETIREMENT ELIGIBILITY

Full Benefits:	Age 55 & 5 Years of Service
	or
	Any age with 25 Years of Service
Maximum Benefit:	75%

Retirement

Old Basis: Table based upon 1985-88 Washington State Patrol Retirement System experience.

New Basis: Plan I - Table based upon 1991-94 Washington State Patrol Retirement System experience.

Please see Table 4 for the new retirement rates.

TABLE 3

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Retirement Rates
1991 - 1994

		OLD ASSUMPTIONS		NEW ASSUMPTIONS	
Age	Actual	Expected	Ratio	Expected	Ratio
46	7	8	.88	7	1.00
47	7	12	.58	11	.64
48	12	21	.57	18	.67
49	24	26	.92	23	1.04
50	29	29	1.00	26	1.12
51	13	20	.65	18	.61
52	15	18	.83	16	.94
53	9	16	.56	14	.64
54	15	13	1.15	12	1.25
55	11	4	2.75	8	1.38
56	6	2	3.00	5	1.20
57	3	1	3.00	3	1.00
58	1	0	NMF	1	1.00
59	2	0	NMF	0	NMF
Total	154	170	.91	160	.96

TABLE 4

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Service Retirement
Probability of Retirement Among Members Eligible to Retire

Age	Probability of Retirement
up to 50	45%
51-55	40%
56-59	35%
60	*

* Immediate retirement is assumed for every person who attains age 60.

DISABILITY

Disability benefits are not provided by the retirement system. Instead, they are provided through the WSP operating budget. However, when the disabled member dies, the retirement system does provide a survivor benefit if there is an eligible spouse.

Initially, the disability status is quite similar to that of termination of employment. In both cases an actively employed member ceases to earn compensation and make contributions to the retirement fund yet does not receive a monthly benefit from the retirement system. However, at age 60 the terminated vested member will begin drawing a pension from the trust fund whereas the disabled member will continue to receive payments from the operating fund for life.

Historically, disability and termination have been difficult to distinguish in our records. Therefore, rather than develop rates separately we will treat them as a combined decrement and then split them apart at the end of the rate setting process. Please see pages 13-15 for a discussion of termination rates.

A history of disabilities is shown below. The table suggests an average of about two disabilities per year, a rate of .2%. The sample is too small to set rates precisely by age or service so the .2% will be applied uniformly to all ages. Our office is working with the Department of Retirement Systems to enhance the reporting on disabled members.

	Disabilities	Active Members
1994	1	958
1993	5	976
1992	1	1012
1991	3	993
1990	3	924
1989	2	866
Total	15	5,729

TERMINATIONS

Our study indicates that general employment turnover has declined since the last study. The patterns of turnover are very high in the early years of service and fall off rapidly thereafter.

At least two successive years of experience are needed to determine the status of a terminating member with any degree of confidence due to the significant number of members who return to work following a short absence.

On the following pages are tables showing the actual and expected terminations using the old and new assumptions. Table 6 contains sample rates of termination.

Old Basis: Plan I and Plan II termination tables based on the 1985-88 Washington State Patrol Retirement System experience with a ten-year select period.

New Basis: Plan I and Plan II tables based on the 1991-94 Washington State Patrol Retirement System experience.

TABLE 5

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Termination Rates
1989 - 1994

		OLD ASSUMPTIONS		NEW ASSUMPTIONS	
Age	Actual	Expected	Ratio	Expected	Ratio
20-24	10	3	3.33	9	1.11
25-29	16	11	1.45	18	.89
30-34	14	9	1.56	13	1.08
35-39	14	8	1.75	10	1.40
40-44	5	10	.50	10	.50
45-49	8	8	1.00	7	1.14
50-54	6	1	6.00	1	6.00
Total	73	51	1.43	68	.93

TABLE 6

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

General Employment Turnover
Probability of Termination and Disability in the Next Year

Age	Termination Rate	Disability Rate	Total
22	2.3%	.2%	2.5%
27	1.3%	.2%	1.5%
32	1.0%	.2%	1.2%
37	.8%	.2%	1.0%
42+	.6%	.2%	.8%

TERMINATION WITH VESTED BENEFIT

The probability of vesting upon termination can be a function of age or service. For younger members with less service, a return of contributions will exceed the discounted value of the future pension benefit. Also there are competing demands for dollars such as mortgage and car payments and pension savings rarely win out. For older, higher service members, the reverse is true. Table 7 displays sample vesting rates.

Old Basis: Percent vested rates based on 1985-89 Washington State Patrol Retirement System experience.

New Basis: Percent vested rates are based on the percent vested table of the 1989-94 Law Enforcement Officers and Firefighters Retirement System experience.

TABLE 7

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Probabilities of Vesting Upon Termination

Years of Service	Percent Vested
Under 5	0%
5	15%
6	20%
7	25%
8	30%
9	35%
10	40%
11	45%
12	50%
13	55%
14	60%
15	65%
16	75%
17	85%
18	90%
19	100%
20	100%
21	100%
22	100%
23	100%
24	100%
25	100%
26	100%
27+	100%

PORTABILITY

Portability increases the liabilities associated with dual members. The increased costs are a function of their salary and service in their later system. The 1989-94 Experience Study determined the following for dual members who are no longer active members:

	PERCENTAGE OF TERMINATIONS WITH DUAL MEMBERSHIP	
	Service ≥5 Years	Service <5 Years
WSPRS	30%	0%

	AVERAGE SALARY OF TERMINATED VESTED	
	All	Dual Members
WSPRS	$29,400	$28,900

SALARY INCREASE

Salary increases usually have two parts: (1) a cost-of-living or inflation component, and (2) a step/longevity increase. This experience study will focus on the step portion of pay increases. The cost-of-living component will be studied with other economic factors in 1995.

We have developed an average scale by studying the salaries reported to the Retirement System. The following table based on reported salaries shows larger salary increases and are definitely identifiable for members in their first years of service. Table 8 displays the actual and expected merit increases for the study period. Table 9 sets out the average percentage increase each year.

STEP/LONGEVITY SALARY INCREASE

Old Basis: Scale based on Salary Scale included in the 1985-88 Washington State Retirement Patrol Experience with a 6-year select period.

New Basis: Scale based on the 1989-94 Washington State Retirement Patrol Experience with a 6-year select period.

TABLE 8

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Step Salary Increase Experience
1991 - 1994

Years of Service	Actual	Expected
1	6.1%	5.5%
2	6.3%	6.0%
3	4.6%	6.0%
4	4.6%	7.1%
5	5.0%	2.6%
6	3.1%	1.6%

TABLE 9

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Step Increases

Years of Service	Percent Increase	Multiple of Entry Salary
1	6.0%	1.124
2	6.0%	1.180
3	5.0%	1.239
4	5.0%	1.295
5	4.5%	1.333
6	3.0%	1.314
7+	0	1.333

NOTE: The above includes only merit increases. During the 1991-1994 period, general salary increases averaged 4.9%

DEVELOPMENT OF AVERAGE FINAL SALARY

The WSPRS benefit is a function of the highest two consecutive years salary (usually the last two). There is great incentive for the member to boost their Average Final Salary by assuming extra responsibilities, working overtime, or deferring a retirement until after a promotion.

Studies have indicated these extra activities have the effect of increasing the Average Final Salary by 8%.

PERCENT MARRIED

Percent Married is the percentage of members, active or retired, who have a spouse eligible for survivor benefits upon the member's death.

Old Basis: Table based on 1985-88 Washington State Patrol Retirement System experience.

New Basis: Experience of the WSPRS is too small to establish rates. The rates adopted will be those of the 1989-94 Law Enforcement Officers and Firefighters Retirement System experience.

Age	Deaths	Survivors	Percentage
55-59	1	1	100%
60-64	3	2	67%
65-69	4	2	50%
70-74	4	2	50%
75-79	6	4	67%
80-84	6	4	67%
85+	1	0	0%
	25	15	60%

TABLE 10

WASHINGTON STATE PATROL
RETIREMENT SYSTEM

Percent Married*

Age	Male
20	20%
25	45%
30	70%
35	90%
40	95%
45	90%
50	85%
55	85%
60	85%
65	80%
70	75%
75	60%
80	45%
85+	30%

* Percentage of members with a spouse who is eligible for a survivor benefit

MILITARY SERVICE CREDIT

For members retiring with at least 25 years of service RCW 43.43.260 (3) provides up to 5 years of service credit for military service. With a large portion of the members having military service, this provision can increase future benefits an average of 7-8%.

Historically, virtually all members had military service, averaging 35 months. Recent retirements show about 75% have an average of 39 months of military service. We will use an average of 2½ years of military service credit for all members.

NEW ENTRANTS

Valuation methods are based on a closed system. This means the impact of new members does not play a part in developing the ongoing cost (Normal Cost) of the system. Though new entrants are not part of the valuation assumptions, there are other applications for these demographic assumptions. For example, New Entrants are studied for use in the projection system. New members enter the projection system not only for growth, but also to replace members who leave for reason of retirement, death, termination, or disability.

Though new entrants may vary by age all have approximately the same starting salary, $28,000.

	NEW ENTRANTS
23	2.78%
24	16.67%
25	8.33%
26	11.11%
27	16.67%
28	8.33%
29	5.56%
30	8.33%
31	8.33%
32	5.56%
33	5.56%
34	2.77%

AGE DIFFERENCE

When a member dies, a surviving spouse (or child) will receive an annuity. The present value of the annuity is a function of the age of the spouse. The average age difference for member age minus beneficiary age is 3.71 years.

IV. Economic Assumptions

Economic assumptions are those used for long-term projections of all the economic factors that affect our pension systems. It may seem unreasonable to attempt a prediction of inflation and investment return over the next 60 years, but it is necessary because of the long-term obligations created by our pension systems. The potential obligation is created on the day of hire. The right to a benefit develops with each year of service, but the benefit is determined by the salary near retirement. Budgeting for the benefit involves estimating its size and accumulating money with investment return to cover the cost.

The impact of economic assumptions on contribution rates can be significant. Every dollar of investment return replaces a dollar of contribution; every salary increase translates into greater benefits and greater contributions.

A good set of economic assumptions are those with the best probability of producing future gains and losses that will offset each other over a long period.

Following is the current set of economic assumptions: New assumptions are to be adopted by the Economic and Revenue Forecast Council by December 31st of each odd-numbered year.

Investment Return Rate	7½%
Salary Inflation Rate	5½%
Consumer Price Index	5%

Growth of Active Membership

Growth in membership is assumed to be 1¼% annually. This assumption is used to determine future salaries for amortizing the Unfunded Actuarial Accrued Liability.

V. Actuarial Valuation Method

The Funding Statutes (Chapter 41.45 RCW) require:

Washington State Patrol Retirement System is to be funded as a level percentage of all future pay needed to fully amortize the Unfunded Actuarial Accrued Liability not later than June 30, 2024.

To satisfy these funding goals we will use a version of the Entry Age Cost Method. Under this method, the Normal Cost of benefits is determined as that contribution rate which, if paid from entry date to retirement date on behalf of the average member of the system, would fully support such member's benefits.

The contribution rate is developed as the sum of the Normal Cost and a rate to amortize the Unfunded Actuarial Liability as a percentage of all future pay by June 30, 2024.